

## Study on Karyotype of Hobby (*Falco subbuteo*) and Kestrel (*Falco tinnunculus*)

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**Abstract** This paper reported karyotypes of the Hobby and Kestrel collected from the suburb of Qiqihaer City. These karyotypes were compared and analyzed, on the basis of the study of karyotypes of nine birds species in Falconiformes by Bian Xiaozhuang and Li Qingwei. It was considered that differences in habits of birds and ecological environment not only cause falcons to differ from others, but also differences in a genus, even within a species. This difference may result from fusion of microchromosomes.

**Key words:** Hobby, Kestrel, Karyotype, Ecological adaptation

### Introduction

Hobbies and Kestrels are middle and small birds of prey in Falconiformes, with very wide distribution in China, living in different types of forests, shrubbery's, forest edges, water areas or near inhabitants. They live solitarily or in pairs, fly very rapidly and prey on small mammals such as rodents, young birds and also insects. Their food habit is very beneficial to the preservation of forests and the regulation of the relative equilibrium of forest ecosystems, so that they are listed in the protected animals Class II<sup>[1]</sup>

Birds of Falconiformes in China are classified into two families, fifty-six species. As to the karyotype research of Falconidae, the sole paper published was "Karyotypes of nine species of Falconiformes"<sup>[2]</sup>. Analysis of the experimental results indicated that the karyotype of Accipitridae was different from the nonhomogeneous karyotype of most birds, but similar to the homogeneous one of most vertebrates. Karyotypes of the Hobby and Kestrel are also clearly different from the original karyotype of birds, being similar to the homogeneous karyotype of Accipitridae, so number of their chromosomes are much reduced,  $2n=48-52$ . In this paper, karyotypes of two species of falcons, collected in the suburb of Qiqihaer City were reported and were discussed in comparison with the above report<sup>[2]</sup>.

### Materials and Methods

Hobby 1 ♂, Kestrel 1 ♀, colchicine was injected into the abdominal cavity of the living bird, at an amount of 2-3 microgram per gram of body weight; bone marrow was collected to prepare slides. 50

early metaphase chromosomes were chosen for counting chromosome number, among which 10 well-dispersed metaphase karyotypes were selected for analysis. Details about methods of slide preparation and analysis, refer to references<sup>[3, 4, 5]</sup>

### Results and Analysis

One male Hobby was examined and its karyotype was shown in Fig.1 and Table 1.

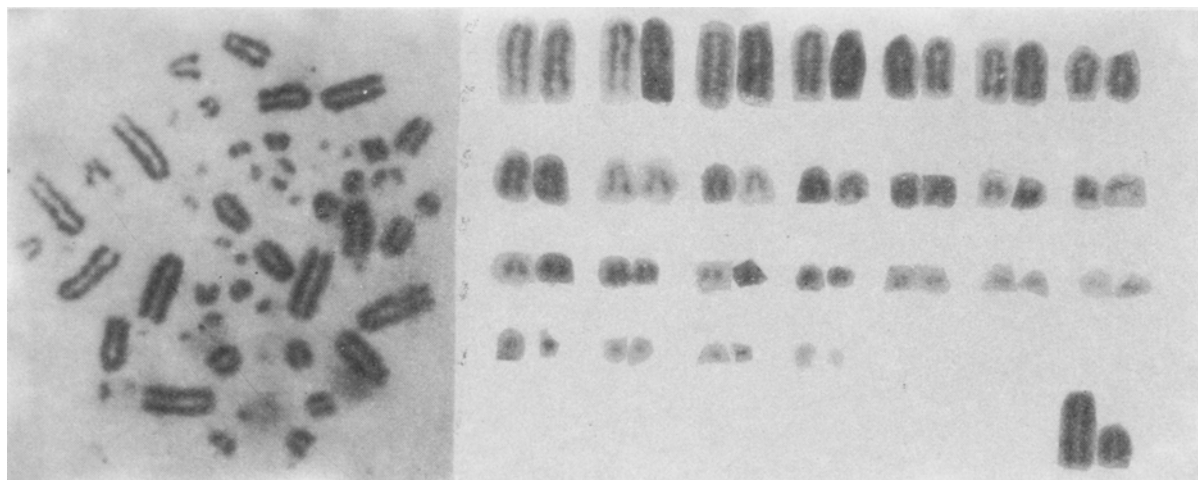
Number of chromosomes were  $2n=50$ , composed of 8 pairs of large chromosomes, 16 pairs of microchromosomes and 1 pair sex chromosome  $2n$  number. The number of large autosomal chromosomes and their length of this karyotype are similar to that of the female Hobby collected in the suburb of Dalian City with insignificant difference in length, but there exist some difference in the position of centromeres. In this paper, the Table 1 indicated that No. 1 was m type, No. 9 was sm type. And No. 2, No. 4 and No. 5 were st type, the others were all t type and dots, while in the karyotype of female Hobby from Dalian, with the exception of No. 1 as m type and No. 9 as sm type, all chromosomes were of t type and dots.

One female Kestrel was examined and its karyotype was shown in Fig. 2 and Table 1.

Number of chromosome were  $2n=52$ , with a karyotype similar to that of the Hobby, and no appreciable difference in the length of 3 pairs of large autochromosomes. The length of Z chromosome is between No. 2 and No. 4, and that of W chromosome is between No. 8 and No. 9. With the exception of sm type of No. 10, the positions of centromeres of all other chromosome take the t type, a little different from that of the Kestrel studied by Bian Xiaozhuang and Li Qingwei.

**Table 1. Results of measurements of chromosomes**

Species	Hobby ♂ 2n=50			Kestrel ♀ 2n=50		
Group No.	Relative Length	Indices of arm ratio Long/short	Form	Relative Length	Indices of arm ratio Long/short	Form
A	1	9.63 ± 0.66	1.29 ± 0.13	m	8.91 ± 0.94	t
	2	9.07 ± 0.57	6.87 ± 0.25	st	8.59 ± 0.45	t
	3	8.86 ± 0.23		t	8.62 ± 0.64	t
	4	7.94 ± 0.48	5.00 ± 0.40	st	7.44 ± 0.50	t
B	5	6.76 ± 0.02	4.43 ± 0.30	st	6.93 ± 0.38	t
	6	6.24 ± 0.60		t	6.19 ± 0.98	t
	7	5.93 ± 0.61		t	4.69 ± 0.43	t
C	8	4.61 ± 0.03		t	4.04 ± 0.23	t
	9	4.05 ± 0.30	1.82 ± 0.52	sm	3.58 ± 0.38	2.66 ± 0.17 sm
	10	3.37 ± 0.03		t	2.94 ± 0.23	t
Z		8.44 ± 0.37		st	7.49 ± 0.56	t
W					4.00 ± 0.05	t


**Fig. 1. Karyotype of male Hobby (Hobby ♂, 2n=50)**

**Fig. 2. Karyotype of female Kestrel (Kestrel ♀, 2n=52)**

## Discussion

Scientists generally consider that chromosomes of birds are relatively stable and conservative<sup>[6]</sup>. Different species of birds in a genus or in different genera, even in different families, may possess very similar, or even same type of karyotypes. Moreover, the original type of karyotype of the bird which took the form of  $2n=80 \pm$ , was composed of 6-8 pairs of heterogeneous large chromosomes and 32-34 pairs of microchromosomes. The fact that karyotypes of most birds are of this type or similar to it confirmed the statement of stability and conservatives of bird karyotypes. However, karyotypes of the Hobby and Kestrel, irrespective of  $2n$  number, centromere position or variation in chromosome sizes, are quite different from the original type.

Most birds bring the sensation of relaxation, liveliness and pleasure to men, and their manner is gentle and cultivated. But, falcons are birds of prey, giving the impression of fierce and cruel bold and powerful. Moreover, they occupy very wide area of distribution and complex environments. External environments cause the change in internal factors, resulting in the significant difference of their karyotype from karyotypes of most birds. The adaptation of organisms to the environment for a prolonged period produced the most adaptive karyotype through evolution for generations. According to the opinion of Bian Xiaozhuang and Li Qingwei, karyotypes of birds of Accipitridae are the intermediate between the homogeneous and nonhomogeneous karyotypes. This study on karyotypes of falcons showed that falcons also possessed this characteristic. So we considered that the falcons were evolutionary more advanced than other birds, and possessed a karyotype different from the

original one.

Karyotypes represented in this paper also indicate that karyotypes of species of the same genus exhibit variations, and the variation may also occur within a species:  $2n$  between the Hobby and Kestrel differ for 2 chromosomes,  $2n$  of the Hobby lack 2 and there are more st types. The reduction in chromosome number may result in the fusion of microchromosome. No. 2, No. 4 and No. 5 chromosomes of the Hobby from Qiqihaer are of st type, different from those of the Hobby from Dalian. No. 10 chromosome of Kestrel from Qiqihaer is different from others, and is of sm type. The reason for the variation within a species is not clear, may be due to inversions between arms and may be related to different regions and ecological adaptation.

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